

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (cancelled)

Claim 2 (currently amended): ~~The method of claim 1 wherein~~
A method for fabrication of microelectromechanical systems (MEMS) integrated micro devices,
the method comprising:

micromachining an array of first three-dimensional micromechanical device features in a first silicon wafer ~~further comprises including~~ micromachining an array of both partial and complete stand-alone three-dimensional micromechanical device features; and

micromachining an array of second three-dimensional micromechanical device features in a second silicon wafer, the second three-dimensional micromechanical device features being configured to cooperate with the first three-dimensional micromechanical device features when joined therewith, and including micromachining an array of both partial and complete stand-alone three-dimensional micromechanical device features, the partial device features in the second silicon wafer being configured to be joined with the partial device features in the first silicon wafer;

mutually aligning the first and second arrays of device features;
permanently joining the first and second arrays of device features into an array of integrated micro devices as a function of permanently joining the first and second silicon wafers into a single composite wafer; and

subsequently separating the array of integrated devices into individual devices each having a set of the first and second device features.

Claim 3 (currently amended): The method of claim 2 wherein the permanently joining the first and second arrays of device features into an array of integrated micro devices further comprises joining the partial device features in the first and second silicon wafers into complete composite device features.

Claim 4 (currently amended): The method of claim 3 wherein the micromachining an array of both partial and complete stand-alone three-dimensional micromechanical device features in a first silicon wafer further comprises micromachining an array of first partial proof masses each connected to a first partial frame by one or more complete stand-alone flexures; and

the micromachining an array of both partial and complete stand-alone three-dimensional micromechanical device features in a second silicon wafer further comprises micromachining an array of second partial proof masses each connected to a second partial frame by one or more complete stand-alone vibratory beams; and

wherein the first and second partial proof masses and the first and second partial frames are mutually configured and arranged relative to the first and second wafers for permanently joining into an array of composite stand-alone three-dimensional micromechanical device features having a composite proof mass each connected to a composite frame by the one or more flexures and the one or more vibrating beams.

Claim 5 (currently amended): The method of claim 4 wherein machining the micromachining the first partial frames further comprises machining a relief arranged to cooperate with each of the one or more vibrating beams.

Claim 6 (currently amended): The method of claim 4, further comprising:

determining for a plurality of the first wafers wafer a minimum yield of the first three-dimensional micromechanical device features micromachined therein;

determining for a plurality of the second wafers wafer a minimum yield of the second three-dimensional micromechanical device features micromachined therein; and

wherein each of mutually aligning the first and second arrays of device features and permanently joining the first and second arrays of device features into an array of integrated micro devices further comprises using one of the first wafers determined to have a minimum yield of the first three-dimensional micromechanical device features micromachined therein and one of the second wafers determined to have a minimum yield of the second three-dimensional micromechanical device features micromachined therein.

Claim 7 (original): The method of claim 4, further comprising providing means for vibrating each of the one or more vibratory beams at a respective resonant frequency when the composite proof mass is at rest.

Claim 8 (cancelled)

Claim 9 (currently amended): The method of claim 8-10 wherein permanently bonding the first and second wafers into a single composite wafer further comprises high-temperature silicon fusion bonding the first and second wafers.

Claim 10 (currently amended): ~~The method of claim 8 wherein:~~

A method for fabrication of microelectromechanical systems (MEMS) integrated micro devices, the method comprising:

forming an array of first three-dimensional micromechanical device features in the each of a plurality of first silicon wafers each having top and bottom substantially parallel surfaces spaced apart by a thickness of the first silicon wafer material, including further comprises forming an array of first three-dimensional proof masses suspended for motion relative to first frames by one or more flexures;

applying a first alignment mark to a face of each of the first wafers relative to the array of first device features;

in each of a plurality of second silicon wafers each having top and bottom substantially parallel surfaces spaced apart by a thickness of the second silicon wafer material, forming an array of second three-dimensional micromechanical device features in the second silicon wafers further comprises that includes one or more device features that are different from one or more of the first device features formed in the first wafers and are configured to cooperate with different ones of the first device features formed in the first wafers, including forming an array of second three-dimensional proof masses suspended for motion relative to second frames by one or more vibratory beams;

applying a second alignment mark to a face of each of the second wafers relative to the array of second device features;

preparing one of each of the first and second wafers for wafer bonding;

mutually aligning the first and second wafers as a function of aligning the respective first and second alignment marks; and

permanently bonding the first and second wafers into a single composite wafer having the first device features formed in the first wafer permanently bonded to the second device features in the second wafers configured to cooperate therewith further comprises including permanently bonding respective first and second three-dimensional proof masses frames into single composite three-dimensional proof masses frames, and permanently bonding respective first and second three-dimensional proof masses frames into single composite three-dimensional proof masses frames suspended from respective composite proof masses frames by respective flexures and coupled thereto by respective vibratory beams.

Claim 11 (original): The method of claim 10, further comprising forming a plurality of electrical conductors over each of the vibratory beams, including wire bond pads electrically coupled to the electrical conductors.

Claim 12-20 (cancelled)

Claim 21 (new): A method for fabrication of microelectromechanical systems (MEMS) integrated micro devices, the method comprising:

micromachining an array of first three-dimensional micromechanical device features in a first silicon wafer, the first three-dimensional micromechanical device features including at least one partial three-dimensional micromechanical device feature;

micromachining an array of second three-dimensional micromechanical device features in a second silicon wafer, the second three-dimensional micromechanical device features being configured to cooperate with the first three-dimensional micromechanical device features and including at least one partial three-dimensional micromechanical device feature that is configured to be joined with the partial device feature in the first silicon wafer;

mutually aligning the first and second arrays of device features;

permanently joining the first and second arrays of device features into an array of integrated micro devices as a function of permanently joining the first and second silicon wafers into a single composite wafer; and

subsequently separating the array of integrated devices into individual devices each having a set of the first and second device features.

Claim 22 (new): The method of claim 21 wherein the permanently joining the first and second arrays of device features into an array of integrated micro devices further comprises joining the partial device features in the first and second silicon wafers into at least one complete composite device feature.

Claim 23 (new): The method of claim 22 wherein the micromachining of at least one partial three-dimensional micromechanical device feature in a first silicon wafer further comprises micromachining an array of first partial proof masses each connected to a first partial frame by one or more flexures; and

the micromachining of at least one partial three-dimensional micromechanical device feature in a second silicon wafer further comprises micromachining an array of second partial proof masses each connected to a second partial frame by one or more vibratory beams; and

wherein the first and second partial proof masses and the first and second partial frames are mutually configured and arranged relative to the first and second wafers for permanently joining into an array of composite stand-alone three-dimensional micromechanical device features having a composite proof mass each connected to a composite frame by the one or more flexures and the one or more vibrating beams.

Claim 24 (new): The method of claim 23 wherein the micromachining the first partial frames further comprises machining a relief arranged to cooperate with each of the one or more vibrating beams.

Claim 25 (new): The method of claim 23, further comprising providing means for vibrating each of the one or more vibratory beams at a respective resonant frequency when the composite proof mass is at rest.

Claim 26 (new): A method for fabrication of microelectromechanical systems (MEMS) integrated micro devices, the method comprising:

forming an array of first three-dimensional micromechanical device features in each of a plurality of first silicon wafers, the first device features including first proof mass and frame features with each of the first proof mass features being suspended for motion relative to one of the first frame features by one or more flexure features;

applying a first alignment mark to a face of each of the first wafers relative to the array of first device features;

forming an array of second three-dimensional micromechanical device features in each of a plurality of second silicon wafers, the second device features including second proof mass and frame features that are configured to cooperate with the first proof mass and frame features;

applying a second alignment mark to a face of each of the second wafers relative to the array of second device features;

preparing one of each of the first and second wafers for wafer bonding;

mutually aligning the first and second wafers as a function of aligning the respective first and second alignment marks; and

permanently bonding the first proof mass and frame features to the second proof mass and frame features.

Claim 27 (new): The method of claim 26 wherein the permanently bonding the first proof mass and frame features to the second proof mass and frame features further comprises permanently bonding respective first and second three-dimensional frames into single composite three-dimensional frames, and permanently bonding respective first and second three-dimensional proof masses into single composite three-dimensional proof masses that are suspended from respective composite frames by respective flexures and are coupled thereto by respective vibratory beams.

Claim 28 (new): The method of claim 27, further comprising forming a plurality of electrical conductors over each of the vibratory beams, including wire bond pads electrically coupled to the electrical conductors.

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Claim 29 (new): The method of claim 26 wherein the forming an array of first three-dimensional micromechanical device features in each of a plurality of first silicon wafers further comprises forming one or more flexures between corresponding proof mass and frame features.

Claim 30 (new): The method of claim 26 wherein the forming an array of second three-dimensional micromechanical device features in each of a plurality of second silicon wafers further comprises forming one or more vibratory beams between corresponding proof mass and frame features.

Claim 31 (new): The method of claim 30 wherein the forming an array of first three-dimensional micromechanical device features in each of a plurality of first silicon wafers further comprises:

forming one or more flexures between corresponding proof mass and frame features, and
forming a relief in the first frame features that is arranged to cooperate with each of the one or more vibrating beams.